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EXAMINER	
HORNING, JOEL G	

ART UNIT	PAPER NUMBER
1792	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)
	10/521,566	HOLM ET AL.
	Examiner	Art Unit
	JOEL G. HORNING	1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 May 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) *26-37* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. **Claims 26-37** are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10-08-2008.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 3 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites the limitation "said predetermined degree" in line 4. There is insufficient antecedent basis for this limitation in the claim.

The term "reduced to a preset degree" in claim 11 is a relative term which renders the claim indefinite. The term "reduced to a preset degree" is not defined by the claim, and the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. It is not clear what reduction of excess flow constitutes it being moved “reduced to a preset degree”. Therefore, one would not know what the metes and bounds of the claims are.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. **Claims 1, 3-7, 9, 10, 12, 14, 19-21 and 23** are rejected under 35 U.S.C. 102(b) as being anticipated by La et al US 5320250.

The instant claims are directed towards a method of jetting droplets of a viscous medium onto a substrate comprising of: Providing a nozzle, feeding a controlled amount of viscous medium into a nozzle space *(which is an adjustment of the volume of viscous material in the nozzle space)*, and impacting said viscous medium thereby jetting the medium towards the substrate, *wherein the degree to which material is added to the nozzle space varies with some dependence on the specific volume of each droplet to be ejected*.

La et al teach a method of jetting drops of viscous material onto a substrate wherein:

> A first embodiment of our apparatus includes a reservoir that holds a predetermined volume of a viscous material. A chamber communicates with the reservoir for continuously receiving the viscous material therefrom. The chamber has a flexible resilient diaphragm which forms an exterior wall thereof. An impact mechanism, which may comprise a solenoid actuated hammer, applies a predetermined momentum to the diaphragm to propel a predetermined minute quantity of the viscous material from the chamber through a nozzle at a high velocity. This minute quantity takes the form of a very small jet of fluid. As the impact energy is removed by means of a stop, the sudden decrease of the chamber pressure and the forward momentum of the jet "pinches" the jet to form a droplet, or blob... The diaphragm may be made of a synthetic

> material or it may be made of a thin metal sheet. In the latter case, a resilient compressible bumper such as an O-ring is provided under the metal sheet to rapidly restore the original configuration of the sheet after being struck by the hammer. The reservoir is preferably pressurized with gas to force the viscous material into the chamber for the purpose of refilling the chamber. Dispensing rates in excess of four blobs per second can be achieved (col 2, line 45 to col 3, line 3).

The desired specific volume of the droplet is dependent on the volume of viscous material previously fed into the chamber. At the very least, enough material must be added to the nozzle space so that there is at least the desired specific volume of the viscous material present in the nozzle space in order to be ejected as the drop. If the amount entering is greater than the amount leaving, the device will rupture. If the opposite is true, then the chamber will empty and be unable to jet. Thus, in this way, the degree of filling in the described embodiment must be dependent on the volume of the droplet to be ejected. La et al further teaches varying the sizes of the droplets by moving set screws as desired (col 5, lines 36-42) via motor connected to a controller (col 6, lines 54-63). Thus the amount that must enter the nozzle space will need to vary as different sizes of droplets are produced. Thus, claim 1 is inherent to the teaching of La et al **(claim 1)**.

Per claims 3, 14, 20, 21 and 23, since the La et al process is controlled to eject each droplet with its desired droplet volume, in a jetting sequence, the rate of feeding, the feeding pressure, and the feeding duration must have been regulated so as to produce that desired size droplet in the time between the jetting of each droplet in the sequence. Whatever exit velocity is achieved

Per claim 4, see figures 3-5, the taught filling opening is on the opposite side from the nozzle, next to the diaphragm(which forms a wall of the chamber), and when the diaphragm configuration is restored the increase in chamber volume will result in the portion of the nozzle space closest to the outlet being free of viscous material. This can be seen clearly in figure 9 of the second embodiment.

Per claim 5-7, La teaches a method that includes jetting multiple droplets. After a droplet is jetted, the diaphragm returns to its original position, which as stated for claim 4 reduces the volume of viscous medium in the nozzle space. Furthermore, the anvil requires some time to return to a start position (idle position) and strike again (a pause). La teaches that during this time the chamber is refilled to what is, as discussed previously, a preset degree.

Per claims 9, 10 and 12, for material to be jetted it must first be fed into the chamber, this is accomplished in the La et al process by activating a feeder(pressurizing it), which must occur at some predetermined time and would result in some predetermined pressure that would be required before the material would flow into the chamber. These claims are inherent to the La et al process.

Per claim 19, however controlled (i.e. feeding time or feeding rate) the feeder operation must be controlled to supply the necessary volume of material into the chamber; it is an inherent feature of La et al.

Per claim 23, whatever exit velocity is achieved using the impact characteristics of La et al is the desired exit velocity, so the chosen impact characteristics are a regulation to create the desired exit velocity.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. **Claims 8, 11, 13 and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over La et al as applied in the 102(b) rejection above.

Claims 11, 13 and 20 require controlling the filling rate, pressure or duration in order to fill the chamber with an appropriate volume of viscous material so that jetting can occur at some desired rate. As stated above, La et al teach controlling the pressure in order to refill the chamber with the desired volume, and pressure is a well known result effective variable for determining the rate of fluid flow and thus the duration of the refilling process required to reach that desired volume. It would have been obvious to a person of ordinary skill at the time of invention that the pressure of the filling step well known user controllable process variables and to adjust them to produce the desired filling rate, duration and volume of viscous material in the chamber prior to jetting for different jetting sequences **(claims 13 and 20)**.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time of invention to control the feeding operation (including its duration) such that no viscous material is fed into the nozzle space beyond what is required to refill it, such a person would be motivated to do so in order to avoid wasting the viscous material and thus reduce the material costs during operation **(claim 11)**.

Claim 8 requires moving the impact hammer into the idle position in such a way that no unintentional jetting of the viscous medium is produced.

La et al teaches that the spring bias is a result effective variable for controlling the impact hammer's return velocity (col 6, lines 48-53).

It would have also been obvious to a person of ordinary skill in the art at the time of invention to produce “no unintentional jetting of the viscious medium" through routine optimization of the spring bias, since that person would have been motivated to

minimize the viscous material losses in order to increase the yield of jetted drops, since it has been held that when the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. See In re Boesch, 205 USPQ 215 (CCPA 1980).

6. **Claims 15-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over La et al as applied to claim 1 and 5 above, and further in view of Tzeng et al US 5988526.

The instant claims are directed towards the use of a vacuum to produce gas across the nozzle outlet in order to remove residual viscous material from the nozzle outlet.

La et al teach a jetting device for viscous material and that clogging of the device is a concern(col 2, lines 30-32) , but do not teach the use of a vacuum device to clean the nozzle.

However, Tzeng et al teach a "nozzle that has a vacuum hood which delivers a vacuum to remove residue from the nozzle and exterior of the nozzle" (col 1, lines 14-16). Further teaching doing so in order to reduce the chance of clogging the nozzle outlet (col 1, lines 24-25) as well as to reduce the chance of dripping the residue onto the substrate (col 2, lines 14-15).

It would have been obvious to a person of ordinary skill in the art at the time of invention to use the vacuum hood of Tzeng et al with the nozzle of La et al. That person would have been motivated to do so to reduce the chance of clogging the nozzle outlet as well as to reduce the chance of dripping the residue onto the substrate.

7. **Claim 22** is rejected under 35 U.S.C. 103(a) as being unpatentable over La et al as applied to claim 1 above, and further in view of Berg et al US6450416.

The instant claim is directed to a jetting device with a feed screw being used to feed the viscous medium.

La teaches such a jetting device, but silent about a feed screw as the feeding mechanism (supra).

However, Berg et al teaches the use of a feed screw on a device for jetting viscous materials in order to obtain improved control of the feeding rate (col 2, lines 24-40). It would have been obvious to a person of ordinary skill in the art at the time of invention to use the feed screw of Berg et al with the method of La et al in order to obtain improved control of the feeding rate.

8. **Claims 24-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over La et al as applied in the 102(b) rejection above in view of LaBudde et al (US 6589791).

The claims further require controlling the (hammer) impact velocity of the device to produce predetermined and controllable exit velocities for the drops, regardless of size. Specifically, applicant claims the use of higher impact velocities for smaller drops and lower impact velocities for larger drops.

La et al teach the use of a solenoid actuated hammer wherein “an impact mechanism, which may comprise a solenoid actuated hammer, applies a predetermined momentum to the diaphragm for rapidly metering a predetermined minute blob of the viscous material from the chamber through the nozzle”(abstract). The depth of the

hammer impact is controlled independently from the solenoid, so the impact velocity is an independent variable controlled by the solenoid energizing signal (col 5, lines 28-42).

It would have been obvious to a person of ordinary skill at the time of invention that these are known user controllable process variables and to adjust them to produce the desired volume of viscous material in the chamber prior to jetting for different jetting sequences. Furthermore, splashing is undesirable for a controlled area deposition process (it reduces the accuracy of the deposition location. It is well known to the art of fluid flow that fluids will splash if they impact a surface at too high of a velocity(see supporting document enclosed in PTO-892 LaBudde et al. US 6589791, when to control their microfluidic dispersing system they teach that if the nozzle velocity of the drops is too high, splashing may result (col 25, lines 1-45)).

It would have been obvious to a person of ordinary skill at the time of invention that these are known user controllable process variables and to adjust them to produce a desired exit velocity, including increasing the impact velocity for small drops and reducing it for large drops in order to limit the exit velocity to a level that would avoid splashing.

9. One would been motivated to make such modification in order to run the process at as fast a rate as possible without reducing the accuracy of the targeting of the drops.

10. **Claims 1, 3, 4, 11, 14, 19, 21 and 22 are** rejected under 35 U.S.C. 103(a) as being unpatentable over Maruyama (US 2002/0025260) in view of La et al (US 5320250).

The instant claims are directed towards a method of jetting droplets of a viscous medium onto a substrate comprising of:

a. Providing a nozzle,

b. feeding a controlled amount of viscous medium into a nozzle space (which is an adjustment of the volume of viscous material in the nozzle space), and

c. impacting said viscous medium thereby jetting the medium towards the substrate,

wherein the degree to which material is added to the nozzle space varies with some dependence on the specific volume of each droplet to be ejected.

Maruyama is directed towards a method for intermittently discharging highly accurate minute quantities of viscous fluid (e.g. adhesives and solder paste) onto a substrate [0001-0002], such as for the surface mounting of chips [0164] at a high speed and with high accuracy [0165]. The process includes supplying a nozzle **7** [0125], feeding a controlled amount of viscous medium into a nozzle space (the space between the piston and the nozzle outlet) (figures 2c and 2d) [0133-0144], and impacting [0158] said viscous medium thereby discharging the viscous fluid from the nozzle onto said substrate (figure 2e) [0145-0148]. The amount of fluid discharged is varied by controlling the stroke length of the piston [0148]. Since the discharge stroke is completed when the piston hits the end surface of the nozzle (figure 2f) [0150], the amount of fluid to be discharged is dependent upon the degree to which the nozzle space is filled before the discharge. Maruyama does not specifically teach if the discharged fluid is jetted in the form of a droplet.

However, La et al is also directed towards dispensing minute amounts of viscous materials, like adhesives and solder paste, such as for surface mounting of chips (col 2, lines 6-11). La et al teaches that when dispensing minute quantities of viscous fluids, the fluid should be in the form of a discrete droplet in order to avoid the need to wet the substrate or pull back the dispensing tip during dispensing (col 2, lines 22-26).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention performing the process of Maruyama to dispense the material in the form of a droplet, in order to avoid needing to wet the substrate or pull back the tip during dispensing.

La et al further teaches that drop should be dispensed, through jetting, by rapidly impacting the viscous material, in order to eject the material at a high velocity (col 2, lines 49-59). This rapid dispensing of the material desirably allows a pattern of the material to be formed more quickly than it would if the material was slowly dispensed (col 1, lines 57-68).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention performing the process of Maruyama to impact the material such that a high speed droplet of the viscous material is jetted, in order to dispense the material more rapidly, increasing the speed at which a pattern of material is deposited, which increases the throughput of the process **(claim 1)**.

11. **Claims 3, 11, 14 and 21** require controlling the filling rate, pressure or duration in order to fill the chamber with an appropriate volume of viscous material so that jetting can occur at some desired rate. As stated above, Maruyama teaches controlling the

pressure in order to refill the chamber with the desired volume, and pressure is a well known result effective variable for determining the rate of fluid flow and thus the duration of the refilling process required to reach that desired volume. It would have been obvious to a person of ordinary skill at the time of invention that the pressure of the filling step well known user controllable process variables and to adjust them to produce the desired filling rate, duration and volume of viscous material in the chamber prior to jetting for different jetting sequences **(claims 3, 14 and 21)**.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time of invention to control the feeding operation (including its duration) such that no viscous material is fed into the nozzle space beyond what is required to refill it, such a person would be motivated to do so in order to avoid wasting the viscous material and thus reduce the material costs during operation **(claim 11)**.

12. Regarding **claim 4**, see Maruyama figures 2A-2E, the taught filling opening is on the opposite side from the nozzle, next to the piston (which forms a wall of the chamber), and when the piston configuration is restored the increase in chamber volume will result in the portion of the nozzle space closest to the outlet being free of viscous material. As shown in figure 2D, the end of the nozzle **7** is free of viscous fluid until the impact stoke of figure 2E when the fluid is pushed through it.

13. Regarding **claim 19**, for material to be jetted it must first be fed into the chamber, this is accomplished in the Maruyama process by activating a feeder to create a predetermined pressure (figure 12) [0245], which must occur at some predetermined time and would result in some predetermined pressure that would be required before

the material would flow into the chamber. Creating this predetermined pressure is a regulation of the feeding operation of said feeder. These limitations are readily apparent from the Maruyama in view of La et al process.**Claim 22**, claim is directed to a jetting device with a feed screw being used to feed the viscous medium. Maruyama teaches using a feed screw to supply the viscous medium (figure 12) [0245].

14. **Claims 15-18** are rejected under 35 U.S.C. 103(a) as being unpatentable over Maruyama in view of La et al as applied to claim 1 and 5 above, further in view of Tzeng et al US 5988526.

The instant claims are directed towards the use of a vacuum to produce gas across the nozzle outlet in order to remove residual viscous material from the nozzle outlet.

As discussed previously, Maruyama teaches that dripping from the nozzle is undesirable [0157], but it does not teach removing residual viscous material from outside the nozzle by means of a vacuum.

However, Tzeng et al, is also directed towards methods of dispensing liquids from nozzles. It also teaches that fluid dripping from the nozzle is undesirable, since it can undesirably damage a work surface (col 1, lines 25-30). In order to overcome this problem, it teaches using a "nozzle that has a vacuum hood which delivers a vacuum to remove residue from the nozzle and exterior of the nozzle" (col 1, lines 14-16).

Thus, it would have been obvious to a person of ordinary skill in the art at the time of invention to use the vacuum hood of Tzeng et al with the nozzle of Maruyama in

view of La et al. That person would have been motivated to do so to reduce the chance of dripping the residue on the outside of the nozzle onto the substrate.

15. **Claims 23-25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Maruyama in view of La et al as applied to claim 1 further in view of LaBudde et al (US 6589791).

The claims further require controlling the (hammer) impact velocity of the device to produce predetermined and controllable exit velocities for the drops, regardless of size. Specifically, applicant claims the use of higher impact velocities for smaller drops and lower impact velocities for larger drops.

Maruyama teaches that the depth of the hammer strike (the height of the piston) determines the volume of fluid ejected, so that the hammer impact velocity (speed of the piston, which determines the resulting pressure and velocity of the fluid) is independently controllable from the volume of fluid ejected [0147-0148].

Thus, it would have been obvious to a person of ordinary skill at the time of invention that these are known user controllable process variables and to adjust them to produce the desired volume of viscous material in the chamber prior to jetting at a desired jetting exit velocity for different jetting sequences **(claim 23)**.

Maruyama does not teach controlling the exit velocity of the drops so that higher impact velocities are used for smaller drops and lower impact velocities for larger drops.

However, LaBudde et al is directed towards a method for rapidly dispensing droplets of different sizes (abstract), it teaches that if the nozzle velocity of the drops is too high, when the droplets impact a surface, undesirable splashing will result (col 25,

lines 1-45)). So a person of ordinary skill in the art is motivated to perform the process as fast as possible (to increase throughput) while avoiding the undesired splashing.

Thus it would have been obvious to a person of ordinary skill at the time of invention that these are known user controllable process variables and to adjust them to produce a desired exit velocity, including increasing the impact velocity for small drops and reducing it for large drops in order to limit the exit velocity to a level that would avoid splashing.

One would been motivated to make such modification in order to run the process at as fast a rate as possible without reducing the accuracy of the targeting of the drops **(claims 24 and 25)**.

Conclusion

No current claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792